

Claims

[c1] 1. A method for operating an engine in a vehicle, the vehicle including an electric machine operatively connected to the engine and capable of controlling a speed of the engine, the method comprising:

providing an amount of fuel to the engine based at least in part on a desired output of the engine;

commanding the electric machine to control the engine speed based at least in part on the desired engine output;

determining an output error of the engine based at least in part on the command to the electric machine, the engine output error being defined as a difference between the desired engine output and a determined engine output; and

adjusting at least one engine parameter to reduce the engine output error when at least one predetermined condition is met.

[c2] 2. The method of claim 1, the engine being a spark ignition engine, and wherein the at least one engine parameter includes a spark timing.

[c3] 3. The method of claim 1, the engine being a diesel en-

gine, and wherein the at least one engine parameter includes a fuel injection timing.

- [c4] 4. The method of claim 1, wherein the at least one engine parameter includes the amount of fuel provided to the engine.
- [c5] 5. The method of claim 4, the vehicle further including a throttle, wherein the at least one predetermined condition further includes at least one of the engine output error being greater than a predetermined amount, a time since engine start being below a predetermined time, a position of the throttle being less than a predetermined throttle position, an engine coolant temperature being stable, and the engine not being in a crank mode.
- [c6] 6. The method of claim 5, wherein the desired engine output is a desired engine torque, and the engine output error is an engine torque error.
- [c7] 7. The method of claim 6, further comprising:
 - determining a first adjustment factor for adjusting the amount of fuel provided to the engine, the first adjustment factor being based at least in part on the engine torque error; and
 - applying the first adjustment factor to the amount of fuel provided to the engine, thereby increasing the amount of

fuel provided to the engine when the first adjustment factor is positive, and reducing the amount of fuel provided to the engine when the first adjustment factor is negative.

- [c8] 8. The method of claim 7, wherein the first adjustment factor is based in part on a load modifier related to a load on the engine.
- [c9] 9. The method of claim 8, the vehicle further including a throttle, and wherein the load modifier is based on a position of the throttle.
- [c10] 10. The method of claim 9, further comprising:
 - updating the engine torque error;
 - determining a second adjustment factor based at least in part on the updated engine torque error; and
 - adjusting the amount of fuel provided to the engine when the second adjustment factor differs from the first adjustment factor by more than a predetermined number.
- [c11] 11. A method for operating an engine in a vehicle, the vehicle including an electric machine operatively connected to the engine and capable of controlling a speed of the engine, the method comprising:
 - determining a desired torque for the engine based at

least in part on a driver input; providing an amount of fuel to the engine based at least in part on the desired torque; determining a desired speed for the engine based at least in part on the driver input; commanding the electric machine to control the speed of the engine based at least in part on the desired speed; determining whether at least one predetermined vehicle condition is met; determining a torque for the engine based at least in part on the command to the electric machine; determining an engine torque error defined as a difference between the desired torque and the determined torque; and adjusting the amount of fuel provided to the engine when the engine torque error is greater than a predetermined amount, and when the at least one predetermined condition is met.

[c12] 12. The method of claim 11, the vehicle further including a throttle, and wherein the at least one predetermined condition includes at least one of a time since engine start being below a predetermined time, a position of the throttle being less than a predetermined throttle position, an engine coolant temperature being stable, and the engine not being in a crank mode.

[c13] 13. The method of claim 11, further comprising determining an adjustment factor for adjusting the amount of fuel provided to the engine, the adjustment factor being based at least in part on the torque error; and applying the adjustment factor to the amount of fuel provided to the engine, thereby increasing the amount of fuel provided to the engine when the adjustment factor is positive, and reducing the amount of fuel provided to the engine when the adjustment factor is negative.

[c14] 14. The method of claim 13, further comprising: determining additional engine torque errors over time based at least in part on additional commands to the electric machine; determining additional adjustment factors based at least in part on corresponding additional torque errors; adjusting the amount of fuel provided to the engine when one of the adjustment factors differs from an immediately preceding adjustment factor by more than a predetermined number.

[c15] 15. The method of claim 14, wherein each of the adjustment factors is based in part on a corresponding load modifier related to a load on the engine.

[c16] 16. The method of claim 15, the vehicle further including

a throttle, and wherein each of the load modifiers is based on a corresponding throttle position.

- [c17] 17. A vehicle having an engine and a control system for operating the engine, the vehicle comprising:
an electric machine operatively connected to the engine and capable of controlling a speed of the engine; and
at least one controller configured to determine a desired output of the engine, provide an amount of fuel to the engine based at least in part on the desired engine output, command the electric machine to control the engine speed based at least in part on the desired engine output, determine an output error of the engine based at least in part on the command to the electric machine, and adjust at least one engine parameter to reduce the engine output error when at least one predetermined condition is met.
- [c18] 18. The vehicle of claim 17, wherein the engine is a spark ignition engine, and the at least one engine parameter includes a spark timing.
- [c19] 19. The vehicle of claim 17, wherein the engine is a diesel engine, and the at lease one engine parameter includes a fuel injection timing.
- [c20] 20. The vehicle of claim 17, wherein the engine parame-

ter includes the amount of fuel provided to the engine.

- [c21] 21. The vehicle of claim 20, further comprising a throttle, and wherein the at least one predetermined condition further includes at least one of a time since engine start being below a predetermined time, a position of the throttle being less than a predetermined throttle position, an engine coolant temperature being stable, and the engine not being in a crank mode.
- [c22] 22. The vehicle of claim 21, wherein the desired output of the engine is a desired engine torque, and the engine output error is an engine torque error.
- [c23] 23. The vehicle of claim 22, wherein the at least one controller is further configured to determine a first adjustment factor for adjusting the amount of fuel provided to the engine, the first adjustment factor being based at least in part on the engine torque error; and apply the first adjustment factor to the amount of fuel provided to the engine, thereby increasing the amount of fuel provided to the engine when the first adjustment factor is positive, and reducing the amount of fuel provided to the engine when the first adjustment factor is negative.
- [c24] 24. The vehicle of claim 23, wherein the first adjustment

factor is based in part on a load modifier related to a load on the engine.

- [c25] 25. The vehicle of claim 24, further comprising a throttle, and wherein the load modifier is based on a position of the throttle.
- [c26] 26. The vehicle of claim 25, wherein the at least one controller is further configured to update the engine torque error, determine a second adjustment factor based at least in part on the updated engine torque error, and adjust the amount of fuel provided to the engine when the second adjustment factor differs from the first adjustment factor by more than a predetermined number.